

WHAT IS CLAIMED IS:

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1. An electronic device comprising a substrate and a semiconductor device, which are connected with each other by means of a Pb-free solder comprising Bi, the semiconductor device having a lead on which an Sn-Bi alloy layer comprising 1 to 20 wt% Bi is formed.
 2. An electronic device according to claim 1, wherein the Pb-free solder comprising Bi is an Sn-Ag-Bi alloy.
 3. An electronic device according to claim 1, wherein the lead is a TSOP lead.
 4. An electronic device according to claim 3, wherein the Pb-free solder provides connection between said TSOP lead and said substrate, via said Sn-Bi alloy layer.
 5. An electronic device according to claim 1, wherein the Pb-free solder provides connection between said lead and said substrate, via said Sn-Bi alloy layer.

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6. An electronic device comprising a substrate and a semiconductor device, which are connected with each other by means of a Pb-free solder comprising Bi, the semiconductor device having a lead made of Cu or a Cu alloy on which an Sn-Bi alloy plating layer comprising 1 to 20 wt% Bi is formed as a surface layer.

7. An electronic device according to claim 6, wherein the Pb-free solder comprising Bi is an Sn-Ag-Bi alloy.

8. An electronic device according to claim 6, wherein the lead is a TSOP lead.

9. An electronic device according to claim 8, wherein the Pb-free solder provides connection between said TSOP lead and said substrate, via said Sn-Bi alloy layer.

10. An electronic device according to claim 6, wherein the Pb-free solder provides connection between said lead and said substrate, via said Sn-Bi alloy layer.

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11. An electronic device comprising a substrate and a semiconductor device, which are connected with each other by means of a Pb-free solder comprising Bi, the semiconductor device having a lead made of Cu or a Cu alloy on which an Sn-Bi alloy layer comprising about 1 to about 20 wt% Bi is directly formed as a surface layer.

12. An electronic device according to claim 11, wherein the Pb-free solder comprising Bi is an Sn-Ag-Bi alloy.

13. An electronic device according to claim 12, wherein the Pb-free solder provides connection between said lead and said substrate, via said Sn-Bi alloy layer.

14. An electronic device according to claim 11, wherein the Pb-free solder provides connection between said lead and said substrate, via said Sn-Bi alloy layer.

15. An electronic device comprising a substrate and a semiconductor device, which are connected with each other by means of a Pb-free solder

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~~comprising Bi, the semiconductor device having a lead made of Cu or a Cu alloy on which an Sn-Bi alloy plating layer comprising about 1 to about 20 wt% Bi is formed as a surface layer without any other plating under-layer.~~

~~16. An electronic device according to claim 15, wherein the Pb-free solder comprising Bi is an Sn-Ag-Bi alloy.~~

~~17. An electronic device according to claim 16, wherein the Pb-free solder provides connection between said lead and said substrate, via said Sn-Bi alloy layer.~~

~~18. An electronic device according to claim 15, wherein the Pb-free solder provides connection between said lead and said substrate, via said Sn-Bi alloy layer.~~

~~19. An electronic device comprising a substrate and a semiconductor device, which are connected with each other by means of a Pb-free solder comprising Bi, the semiconductor device having a lead made of an Fe-Ni alloy on which an Sn-Bi alloy plating layer comprising 1 to 20 wt% Bi is formed as a surface layer.~~

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~~20. An electronic device according to claim 19, wherein the Pb-free solder comprising Bi is an Sn-Ag-Bi alloy.~~

21. An electronic device according to claim 19, wherein the lead is a TSOP lead.

22. An electronic device according to claim 21, wherein the Pb-free solder provides connection between said TSOP lead and said substrate, via said Sn-Bi alloy layer.

23. An electronic device according to claim 19, wherein the Pb-free solder provides connection between said lead and said substrate, via said Sn-Bi alloy layer.

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~~24. An electronic device comprising a substrate and a semiconductor device, which are connected with each other by means of a Pb-free solder comprising Bi, the semiconductor device having a lead made of an Fe-Ni alloy on which an Sn-Bi alloy layer comprising about 1 to about 20 wt% Bi is directly formed as a surface layer.~~

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25. ~~An electronic device according to claim 24, wherein the Pb-free solder comprising Bi is an Sn-Ag-Bi alloy.~~

26. ~~An electronic device according to claim 25, wherein the Pb-free solder provides connection between said lead and said substrate, via said Sn-Bi alloy layer.~~

27. ~~An electronic device according to claim 24, wherein the Pb-free solder provides connection between said lead and said substrate, via said Sn-Bi alloy layer.~~

28. ~~A semiconductor device with a lead, wherein an Sn-Bi alloy layer, which comprises from 1 to 20 wt% of Bi, is formed on the lead.~~

29. ~~A semiconductor device according to claim 28, wherein the lead is a TSOP lead.~~

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30. A semiconductor device with a lead which is made of Cu or a Cu alloy and on which a plating layer of an Sn-Bi alloy is provided, wherein Sn-Bi alloy of the plating layer comprises from 1 to 20 wt% of Bi.

31. A semiconductor device according to claim 30, wherein the lead is a TSOP lead.

32. A semiconductor device with a lead made of Cu or a Cu alloy, wherein an Sn-Bi alloy layer as a surface layer is directly formed on the lead, Sn-Bi alloy of the alloy layer comprising from about 1 to about 20 wt% of Bi.

33. A semiconductor device according to claim 32, wherein the lead is a TSOP layer.

34. A semiconductor device with a lead which is made of Cu or a Cu alloy and on which a plating layer of an Sn-Bi alloy is formed as a surface layer without any plating layer between the lead and the Sn-Bi alloy plating layer, Sn-Bi alloy of the alloy plating layer comprising from about 1 to about 20 wt% of Bi.

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35. A semiconductor device according to claim 34, wherein the lead is a TSOP lead.

36. A semiconductor device with a lead which is made of an Fe-Ni alloy and on which a plating layer of an Sn-Bi alloy is formed as a surface layer, Sn-Bi alloy of the alloy plating layer comprising from 1 to 20 wt% of Bi.

37. The semiconductor device according to claim 36, wherein the lead is a TSOP layer.

38. A semiconductor device with a lead made of an Fe-Ni alloy, wherein an Sn-Bi alloy layer as a surface layer is directly formed on the lead, Sn-Bi alloy of the alloy layer comprising from about 1 to about 20 wt% of Bi.

39. A semiconductor device according to claim 38, wherein the lead is a TSOP lead.

ADD
Be

ADD
Cu

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